metalliferous, and the southern and littoral provinces agricultural. The latter term must, however, be accepted with some qualification, inasmuch as the cereals hitherto produced have been very scanty, and to this day the Republic is an importer of flour. In truth, the natural pasture is so abundant, and alfalfa or lucerne thrives so luxuriantly, that stock-farming is practised almost to the exclusion of all other branches of agriculture.

Major Rickard remarks that mining in La Plata is at once in its infancy and in its old age. An instance of this anomalous state of things may be seen in Mendoza, where the ancient silver mines, El Rosario and San Rumaldo, which were discovered as early as 1638, are again in active operation. The old miners dealt merely or chiefly with what Spaniards term "warm metals" (*metales calidos*), that is, those which could be reduced directly by means of mercury, and this, therefore, left for a later generation the "cold metal" (*metal frio*) which required for its reduction the process of smelting. Silver mines are not by any means confined to the province of Mendoza. In San Juan (where civil war and revolution have long been fatal barriers to all industrial progress) the district of Tontal, on the slopes of the great Andine range, is peculiarly rich in argentiferous lodes; ordinary samples from the Mine Señor containing not less than 160 ounces to the ton, and first class samples yielding 400 ounces. But, in the opinion of Major Rickard, the silver mines of Famatina, in the more northerly province of La Rioja, are the richest in the whole country. That the difficulties in working them are formidable may be gathered from the fact that some are situated 13,000 feet above the sea-level, and that the whole district is deficient in fuel of any sort, and exposed during three months of the year to a rainfall so heavy as to compel the miners to suspend their labours. In the province of Catamarca copper is the predominant metal, and in union with it an appreciable percentage of gold and silver has been found. During the year 1868 the Restauradora mine produced 2,639 tons of ore, containing by assay 506 tons of fine copper; but it must be remembered that the prevailing systems of smelting are by no means perfect.

More than one auriferous district exists within the limits of the Republic, and those which are respectively named Gualilan and Guachi (from *Gua*, which in the Huerpe tongue signifies gold) have for many years enjoyed considerable celebrity. Both of them largely enriched their first workers, and there can be little doubt that thousands of tons of ore still exist in the old workings which have been abandoned, partly from natural difficulties, but principally from the want of skilled labour.

As to the other productions of the Republic, it is impossible in this brief notice of a copious volume to do more than mention them by name. Mendoza and San Juan possess silver-lead mines of considerable extent; and in the former province petroleum springs have been recently discovered. In Santiago del Estero large tracts of land are covered with indigenous indigo; rice and tobacco are cultivated in Tucuman, and in the most northerly provinces of Salta and Jujuy are thriving plantations of coffee.

After making every allowance for Major Rickard's natural enthusiasm, it must be admitted that the country whose resources he has so minutely described, offers many and great inducements to the British emigrant to give it a fair trial. President Sarmiento desires especially to attract a further immigration of our fellow countrymen, for he infers from the success they have already achieved in the cultivation of the Pampas, that their energy and enterprise will be invaluable in developing the mineral resources of the Republic, and that Anglo-Saxon coolness and perseverance will form a favourable counterpoise to the opposite characteristics of the Hispano-American race.

C. J. ROBINSON

OUR BOOK SHELF

An Elementary Course of Hydrostatics and Sound. By Richard Wormell, M.A., B.Sc. Fcap. 8vo, pp. viii. and 146. (London: Groombridge and Sons, 1870.)

THIS little book is "designed for the use of schools, colleges, and candidates for University and other examinations." In such a work it would of course be out of the question to look for novelty of matter: by the nature of the case, to praise the author's originality would be to cast a doubt on his accuracy; and, while inaccuracy would be inexcusable, no merit can be claimed for its opposite. Hence, in trying to form an estimate of a book like this, we are inevitably led to consider whether the subjects treated are arranged in a simple and natural order; whether the exposition of principles is clear and logical, the really fundamental matters being kept constantly and prominently before the student's mind, and special consequences and applications grouped about them in such a manner as to show distinctly their mutual connection and dependence: whether, in short, the book is scientific in treatment as well as in subject. We are sorry to say that, in these respects, our judgment of the work before us is by no means favourable. We should expect a student, instead of acquiring from it ideas which are capable of growth and expansion within his own mind, and being led towards the conception of the organic connection of all scientific truth, to conclude that science—or at least hydrostatics and acoustics—consists of a series of propositions which it is his duty to "get up" and write out on the first opportunity in answer to examination-questions. The least satisfactory parts of the book are the explanatory and descriptive portions, and especially the twenty-two pages at the end devoted to sound. The author says in the preface that "the whole contains all that is required on these subjects [hydrostatics and sound] for the B.A. and B.Sc. degrees of the University of London." If this is true as regards the latter subject, it is more to the discredit of the University than to the credit of his book.

Studien über das Central Nerven-System der Wirbelthiere. Von Dr. Ludwig Stieda, Prosector in Dorpat. (London: Williams & Norgate.)

DR. LUDWIG STIEDA is already well-known for his admirable papers on the central nervous system of osseous fishes, birds, and some mammals. The present work embraces a description of the central nervous system of the frog, rabbit, dog, cat, mole, and mouse; an account of the course of the fibres in the spinal cord of Vertebrata generally; a comparison of the brain of the various classes of Vertebrata with that of man, and finally, a comparison of the cerebral with the spinal nerves. Of the description of the brain and spinal cord of the several mammals mentioned above we need say nothing here, except to remark that the account is full and carefully drawn up; the minutest structure of the several parts being given as well as their coarser anatomical features. In regard to the brain of the frog, the parts of which have received such different names, Dr. Stieda gives the following description of the organ as it appears when

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viewed from the upper surface. The cerebrum presents the following parts in successive order:—1, the medulla oblongata; 2, the cerebellum; 3, the lobus opticus, with its median furrow; 4, the lobus ventriculi tertii (thalami optici of authors); 5, the lobi hemisphærici, each of which terminates anteriorly in a knob constituting the tuberculum olfactorium. On the under surface of the brain there appear successively from before backwards:—(1) the bases of the lobi hemisphærici; (2) the chiasma of the optic nerves, which last proceed from (3) the lobus opticus, and between which is situated (4) the hypophysis cerebri, and behind this (5) the base of the medulla oblongata. M. Stieda then gives a full description of these parts, and of the various cerebral nerves in the frog. To this succeeds a very good general view or *résumé* of the anatomy of the brain in mammals. We may draw attention to some remarks made in the section where a comparison is made between the brain of man and that of the several classes of Vertebrata. It may be premised that little difficulty is experienced in discovering the homologous parts of the central nervous system of man and the more highly organised mammals. In the birds, however, there are several parts that are difficult to decipher; whilst in Amphibia, and still more in fishes, the nature of the several parts has given rise to much discrepancy of opinion between different observers. Dr. Stieda refers to his former work for the brain of fishes. In regard to Amphibia and reptiles, he considers that the lobi hemisphærici, or anterior lobes, being hollow, and containing a ventricle, are clearly the analogues of the cerebral hemispheres of man. The azygous portion of the central cavity, between the posterior parts of the hemispherical lobes (or ventriculus communis) in the frog, is the indication of the primordial single cavity of the first cerebral vesicle, and consequently establishes the transitional stage between the osseous fishes and the higher Vertebrata. The succeeding segment constituting the lobus ventriculi tertii, (or Zwischenhirn) corresponds in its upper part to the thalami optici; in its lower to the tuber cinereum and lamina cinerea. The third segment, or lobus opticus, agrees exactly with that of fishes, both in its external and internal relations, whilst reptiles exhibit the intermediate type between fishes and birds. Of the nature of the cerebellum there can be no doubt. In regard to birds, he observes, that the great club-like segment of the cerebrum of birds corresponds to the hemisphere of man, the bodies enclosed in them to the corpora striata, the radiated septum to the septum pellucidum. He considers the existence of parts analogous to the corpus callosum and fornix of man to be doubtful. The succeeding segment corresponds to the optic thalami; the large spheroidal body of the lobus opticus to the corpora quadrigemina. Two plates accompany the treatise, which are devoted to the histology of the parts described. H. P.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

The Difficulties of Natural Selection

As Mr. Bennett complains that I have charged him with errors he has not committed (which I should much regret to have done), I must ask permission to justify my statements by a reference to his own words.

1. Mr. Bennett says that he is unable to discover where he has led his readers to understand that there is only one completely mimicking species of *Leptalis*. I will therefore show him where he has done so. In the third column of his article (p. 31) he says: "Another South American genus of Lepidoptera, the *Leptalis*, belongs structurally to an entirely different class, the *Pieridæ*, and the majority of its species differ correspondingly from the *Heliconidæ* in their size, shape, colour, and manner of flying, being nearly pure white. There is, however, *one particular species* of *Leptalis*, which departs widely in external facies from *all its allies*, and so closely resembles a species of *Ithomia* as to deceive," &c. &c. Then comes the argument and the mathematical calculations always referring to "the *Leptalis*," and it is at the end of this, at the bottom of the next column, that we have the following passage (of which Mr. Bennett in his reply has only quoted a line and a half): "For supposing the chance is reduced from one in ten million to one in ten thousand, and it is said that the world has existed quite long enough to give a fair chance of this having occurred once, it is not a solitary instance that we have. Mr. Bates states that in a comparatively small area several distinct instances of such perfect mimicry occur, Mr. Wallace has a store in the Malay Archipelago, Mr. Trimen records several of wonderful completeness in South Africa," &c. Now, as there is not a word here about other species of *Leptalis*, but only about other cases of mimicry, as *Leptalis* is unknown in Africa or the East, as mimicry occurs in other genera and families of Lepidoptera, and other orders of insects, and as Mr. Bennett has himself stated, that the "*one particular species of Leptalis* departs widely in external facies from *all* its allies," I think it will be admitted that I was justified in asserting that Mr. Bennett's readers would be "led to understand," that there was only one species of completely mimicking *Leptalis*. If I was not so justified I confess my ignorance of the English language, and beg Mr. Bennett's pardon.

2. I leave your readers to judge for themselves whether the fact of a *Leptalis* having twenty offspring does or does not affect the mathematical argument as set forth by Mr. Bennett; but when, in answer to my statement, that the right variation has, by the hypothesis, a greater chance of surviving than the rest, he asks: "By what hypothesis? The hypothesis that these small variations are useful to the individual, the very hypothesis against which I am contending as unproved,"—I must protest against his denying his own words. For, at p. 31, col. 1, he says: "The next step in *my argument* is, that the smallest change in the direction of the *Ithomia* which we can conceive, on any hypothesis, to be beneficial to the *Leptalis* is, at the very lowest, one-fiftieth of the change required to produce perfect resemblance;" and six lines farther on, "For the sake of argument, however, *I will suppose* that a change to the extent of one-fiftieth *is beneficial*," and then comes the calculation. Again, I must acknowledge my ignorance of the meaning of words if Mr. Bennett does not here directly contradict himself. I never said the hypothesis was proved, but only that Mr. Bennett's argument, founded on it, was unsound, and for the sake of the argument he had admitted the hypothesis.

Mr. Bennett goes on to say: "The new factor, of which I take no account, is, again, entirely dependent on the admission of the natural selectionist premiss." This new factor is the principle of *heredity*. As he acknowledges that he takes no account of it, we must presume that he denies its existence; and as the whole of Mr. Darwin's theories and my own fall to the ground without it, he might have spared himself the trouble of his "mathematical demonstration."

3. I do not consider, as Mr. Bennett seems to do, that the distinction between "protective resemblance" and "mimicry" is a subtle one. Anyone who reads his paragraph on this subject (p. 32, col. 2) will, I think, be under the impression, as I was, that he alluded to mimicry, or mimetism, properly so called, as being strongly developed in birds. It seems, however, that he means only protective resemblance; but this, I believe, to be equally common among the very lowest forms of life. Transparency, for example, is a great protection to aquatic animals, and it is very prevalent in low organisms. Fishes are all, or almost all, protectively coloured, by the back being dark and the belly light, so that, whether looked at from above on the dark background, or from below on the light one, they are equally difficult to see. In many fishes, too, we have a specific protective resemblance as perfect as in any birds (see "Contributions to the Theory of Natural Selection," p. 55), and this is as much opposed to Mr. Bennett's theory as the absence of true mimicry in birds and mammals.

4. Mr. Bennett says, I have "brought no evidence to show that *extremely small variations* afford any immunity from the attacks of enemies,"—but this was quite unnecessary, because I show that the variations which continually occur in insects are by no means "extremely small." He also says that I "give no explanation of the tendency of the *Leptalis*, referred to by Mr. Bates, to produce naturally varieties of a nature to resemble *Ithomiæ*." But Mr. Bates introduces this remark with—"It would seem as if;" and though I think that the fact may be so,

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